Cost Analysis for Management of Type-2 Diabetes: A Case Study of Rural and Urban Setting

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Abstract

Introduction A prospective study of cost effective analysis for commonly used anti-diabetic drug regimes in urban and rural diabetic population is presented. Despite the fact that diabetes mellitus is a chronic and unique disease, cost effectiveness criteria cannot be overruled. Cost for managing this disease has a major impact on one's social life as certain portion of one's income has to be invested for the management of this disease.

Objectives To assess the clinical and economical aspects of different drug regimens used to treat type-2 diabetes mellitus regarding the cost of therapy. To conduct the cost effectiveness analysis of the different existing therapies for type-2 diabetes mellitus. To see the prevalence of diabetes in a specific blood group.

Methods This study was a prospective observational follow-up Study, designed in two sites, rural and urban areas comprising of 60 patients who were already diagnosed as NIDDM patients and this study was undertaken in Dhulikhel community and Kathmandu's Diabetes clinic from September 2002 to March 2003. Research tool was a structured and pretested questionnaire. Three therapeutic regimens were analyzed in the terms of their cost effectiveness in the treatment of diabetes and the drugs selected for analysis were sulphonylureas, biguanides and the combination therapy.

Results Among the three regimes, combination therapy of both sulphonylurea group and biguanides came to be more cost effective in terms of reducing HbA1c percent significantly as a measure of therapeutic outcome as compared to other ones. Regarding the blood group of diabetics, it was seen that maximum number of diabetics were having blood group O+ve.

Conclusion Diabetes is one of the most costly and burdensome chronic diseases of our time and is increasing in epidemic proportion in Nepal that has called upon the need for the development of national diabetes strategy for the prevention and control of diabetes and its complications.

Keywords Cost effective analysis, Glycolated hemoglobin (HbA1c %).

Introduction

Diabetes mellitus, especially type-2 diabetes mellitus is a major global health problem. An estimated 30 million people worldwide had diabetes in 1985. By 1995, this number had shot up to 135 million. Now, WHO predicts a rise to an alarming 300 million by 2025[1]. It is increasing worldwide in an epidemic form including Nepal[2]. More than 95 percentages of American and Indian populations with diabetes have type 2 diabetes [3,4]. It accounts for between 85-90 percentages of all diabetes. The vast majority of type 2 diabetes occurs in the middle or old age and at least 4 percentage of people in there 60s have diabetes. Diabetes is a major source of morbidity, mortality and economic cost to society. It has been estimated that the annual per capita health care expenditure in the United States in 1997 was four-fold for people with diabetes when compared with general population[5].

Moreover, the cost may be direct as well as indirect. The direct costs can be contributed by Pharmaceutical interventions, laboratory investigations, primary care consultations to the doctor, and hospital outpatient episodes to a very high cost services as long hospital stays and treatment strategies to reduce complications and maintain the day-to-day quality of life[5]. While indirect costs represents the present and future opportunities lost to the individual as a consequence of the disease in question. Many people with diabetes may not be able to continue working or many are not able to work as effectively as they could before the onset of their condition. Transport costs, sickness absence, disability, premature retirement or premature mortality can cause loss of productivity. This has a negative impact on both the quality of life of the person with diabetes at home and in the community and the output of the economy. Intangible costs covers the following; Psychological costs-stress, pain, anxiety, and discrimination in employment as consequence of the loss of productivity associated with diabetes. Individuals' quality of life is affected as a whole and life expectancy can be significantly reduced[3].

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Methodology

This study was a prospective observational follow-up Study, designed in two sites, rural and urban areas comprising of 60 patients who were already diagnosed as NIDDM patients and this study was undertaken in Dhulikhel community and Kathmandu's Diabetes clinic from September 2002 to March 2003. Sampling method used was convenient sampling method and the subjects were visited for their three consecutive follow-ups in a one-month time period gap. Patients were interviewed individually according to a structured and pretested questionnaire and their glycemic levels along with other laboratory investigations for lipid profile abnormalities were observed using laboratory techniques. Data were tabulated and entered in Microsoft Excel. Analysis of the data was done with the help of Statistical Package SPSS 10.0.1 Descriptive statistics of the variables were carried out. The different parameters were compared for the different risk parameters.

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Results and Discussion

Table: 1 Overall age of the patients and sex

Sex of patients	n	Age of patients (Yrs)	P-value
Male	28	51±17	0.0002
Female	32	49±15.50	

*Data were in Mean ± SD, unless otherwise explained.

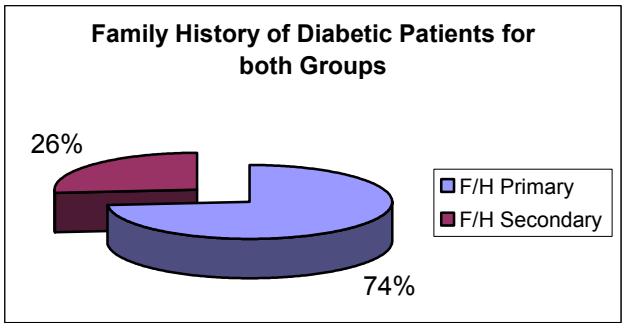
The mean age of male (51±17) Vs female (49±15.50) at P=0.0002. This table shows that there is significant difference between age of male and female patients.

Table: 2 Different types of lifestyles for the two groups of diabetics

	Sedentary	Physically Active	Hectic
Urban	17(56.61%)	12(39.96%)	1(3.33%)
Rural	19(63.27%)	11(36.63%)	0

Figure 1 elaborates the graphical view of the lifestyle of the diabetic subjects belonging to the two groups.

Figure: 1 Family history for both urban and rural group of diabetics



About 50 percent of diabetics from rural area were not having any prior family history for diabetes and from urban area; only 23 percent of diabetics were not having any family history of diabetes.

Maximum percentage (56%) of patients were on the Sulphonylurea group of drugs in the urban group, where as the 46 percentage of patients were observed taking Metformin group of drugs in the rural group of diabetics. (Figure 2a and 2b)

Figure: 2a Treatment History for Diabetes of Urban Population

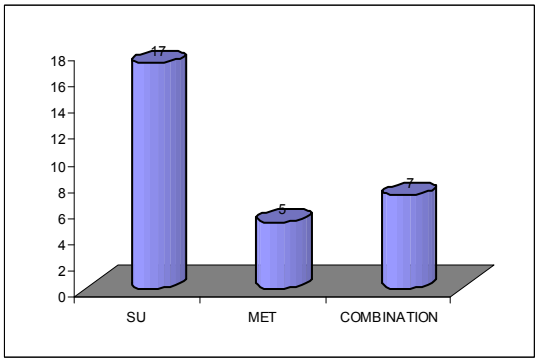


Figure: 2b Treatment History for Rural Diabetic Population

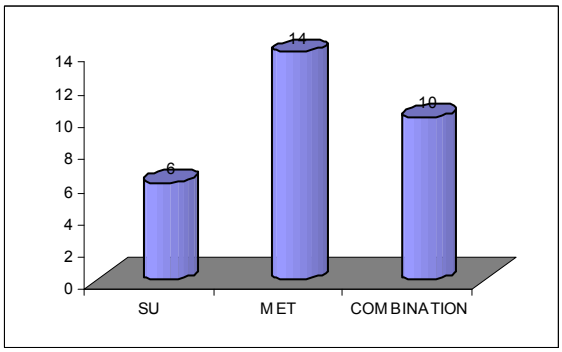
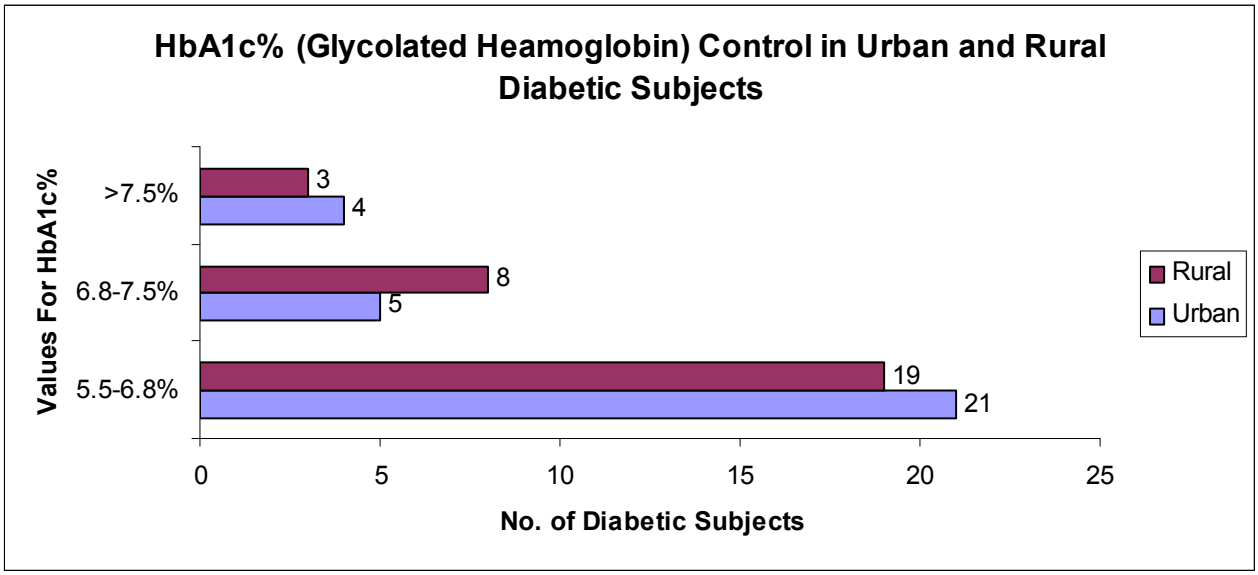


Figure: 3 Glycolated hemoglobin values for the glycemic control of the rural and urban subjects.



Maximum number of subjects belonging to each group were having a good glycemic control, whereas, a greater number of subjects were having a fair glycemic control as compared to the urban subjects and only a few number of patients were having poor glycemic control belonging to both the study sites. The regression coefficient of HbA1c percentage approaches significance at p=0.20. Relationship between HbA1c percentage level and sex of the patients

The sample average HbA1c percentage of the male patients from a sample size 34 was 5.7868 with sample ±SD 1.038, while for the female patients, sample size was 26, and average sample HbA1c percentage was found to be 6.242 with a ± SD 1.071. The difference between the average HbA1c percentage for male and female came to be 0.43, which approaches statistical significance at p=0.49.

According to the Drug and Therapeutic Committee, two types of analyses can be done for Diabetes and they are cost of illness and cost effective analysis (CEA)

Table: 3 Diabetes Cost of Illness Evaluation (Per Patient from the patient's perspective)

Cost of Illness Parameter	**Cost/Year**
Diagnosis	600
Initial Treatment	200
Follow-up Treatment	600
Optometry care	200
Cardiac care	400
Nutritionist	200
Foot care	200
Laboratory tests	1570
Drug costs	900
Other Hospital Services	500
Other Patient related costs	
Transportation costs for medical care	300
Work loss - Loss of productivity	20 percent of his/her income
Total health care and patient costs / yr.	5470/-

Besides these costs as mentioned above, there are so many other accessories that hold a significant cost that is being used in the treatment of a diabetic patient, such as home blood glucose monitor, test strips, lancets, urine sticks, blood pressure measuring equipments and exercising machines.

Table: 4 Cost effective analysis (from the patient's perspective)

	Drug A (SU)	**Drug B (MET)**	**Drug C (Combination)**
Acquisition cost	Rs. 27.00	Rs. 29.82	Rs. 74.85
Lab Cost	Rs. 50.00	Rs. 50.00	Rs. 50.00
ADR Cost	Rs. 10.00	Rs. 10.00	Rs. 20.00
Physician visits	Rs. 200.00	Rs. 200.00	Rs. 200.00
Total Costs	Rs. 287.00	Rs. 289.82	Rs. 344.85

Average reduction of HbA1c percentage = 0.8 0.74 0.92

The average HbA1c percentage observations were made by taking the average of the consecutive glycolated hemoglobin after the follow-ups of the patients and the reduction in HbA1c percentage levels were calculated and used here to calculate the cost effective analysis of the three regimens using it as a therapeutic outcome.

Effective measure = Reduction in glycolated Hemoglobin

Effectiveness of drug = Average reduction of 0.92 percentage glycolated Hemoglobin (among these three drugs)
Cost effective ratio = Drug cost/ Reduction in HbA1c percentage
= 344.85/0.92
= 374.83 for 0.92 percentage reduction of HbA1c percentage

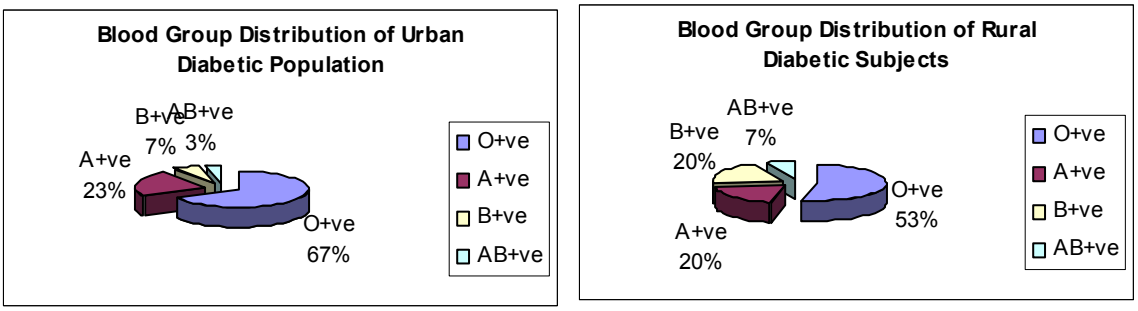
Therefore, Rs. 407.36/- for 1 percentage HbA1cpercentage Reduction.

Thus, it can be seen by the therapeutic outcome in terms of the clinical parameter, i.e. the glycolated hemoglobin has been reduced to a significant level by the use of combination therapy. Thus, for both the group of diabetics, it was seen that, combination of Sulphonylureas and Metformin group of anti-diabetic drugs were cost effective for the Pharmacotherapy of type 2 diabetes.

Among the *Pharma-cotherapeutic* optionsavailable, it was seen that the combination therapy including the Sulphonylureas and the Metformin group was cost effective in terms of reducing the glycolated hemoglobin, which is a clinical parameter for the glycemic control for diabetics. Thus combination regimen was found to be more cost effective, but still it needs further research.

Figure: 4 Result for the blood groupings of the urban and rural diabetic subjects

Figure: 4a Showing the blood group distribution Figure: 4b Showing the blood group distribution



Both the results of the blood group distributions showed that, majority of diabetics were having the blood group O^{+ve} as compared to other groups. 67 percentages of patients were having the blood group O^{+ve}, from the urban site, and 53 percentages of subjects were having the blood group O^{+ve} from the rural site of the study, thus accepting the hypothesis that prevalence of diabetes is seen more in people with blood group O^{+ve}.

Limitation

Due to the limited time span and limited sample size, it could not be the national representative and this needs further research. Similarly, the intangible costs were difficult to estimate in terms of numerical figures, as they were associated with the patients.

Recommendation

1. Cost effectiveness analyses should be used to identify high, medium and low priority interventions to prevent or reduce risks, and that manages disease more effectively with highest priority given to those interventions that are cost effective and affordable.
2. A balance between government, community and individual action is necessary. For example, non-governmental organizations, local groups the media and others should support community action. At the same time, individuals should be empowered and encouraged to make positive, life enhancing health decisions for themselves on matters such as excessive alcohol consumption, smoking, obesity, tobacco use, unhealthy diet and sedentary lifestyles.

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